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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,487	07/25/2003	Hendrik F. Hamann	FIS920020166US1	1486

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EXAMINER	
ARANCIBIA, MAUREEN GRAMAGLIA	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 10/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/604,487	HAMANN ET AL.	
	Examiner	Art Unit	
	Maureen G. Arancibia	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) *17-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 10-16* is/are rejected.

7)☒ Claim(s) *9* is/are objected to.

8)☒ Claim(s) *1-30* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-16, drawn to a method for altering a surface feature on a substrate, classified in class 216, subclass 94.

   II. Claims 17-30, drawn to an apparatus for altering a surface feature on a substrate, classified in class 156, subclass 345.1.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the process of Group I can be practiced by a materially different apparatus, such as a focused ion beam apparatus.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Steven Capella on 09/10/2004 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-16. Affirmation of this election must be made by applicant in replying to this Office action. Claims 17-30 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

7. Claims 1-3, 5, 11, and 16 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 17 and 18 of copending Application No. 10/261,275 ('275), filed on 09/30/2002 by Herschbein, et al. Although the conflicting claims are not identical, they are not patentably distinct from each other.

In regards to Claim 1 of the instant application, Claim 17 of '275 includes the limitations of supplying a fluid to a surface and supplying a localized electric field that

activates a reactant in the fluid. The localized electric field thereby aids in etching and/or depositing a feature on the surface.

In regards to Claims 2 and 3 of the instant application, Claim 17 of '275 includes the limitations of locally supplying a chemical through a channel in a tool that is proximate to the site to be altered.

In regards to Claim 5 of the instant application, Claim 17 of '275 includes the limitation of supplying a fluid to the surface.

In regards to Claim 11 of the instant application, Claim 18 of '275 includes the limitation of supplying a second fluid to the surface.

In regards to Claim 16 of the instant application, Claim 17 of '275 includes the limitation of directing the fluid as a flow towards the site to be altered by directing it through a channel of a tool proximate to said site.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

8. Claims 1-3, 10, and 11 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claim 19 of copending Application No. 10/604,486 ('486), filed on 07/25/2003 by Hamann et al. Although the conflicting claims are not identical, they are not patentably distinct from each other.

In regards to Claim 1 of the instant application, Claim 19 of '486 includes the limitations of locally supplying a chemical to assist in an etching reaction on a surface feature of a substrate, and supplying radiation to said surface feature.

In regards to Claims 2 and 3 of the instant application, Claim 19 of '486 includes the limitations of locally supplying the chemical through a channel in a probe.

In regards to Claim 10 of the instant application, Claim 19 of '486 includes the limitation of supplying light to the surface feature to be etched.

In regards to Claim 11 of the instant application, Claim 19 of '486 includes the limitation of supplying a second chemical to aid in spatially confining the effects of the etching reaction.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

9. Claims 1 and 5 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 and 6 of U.S. Patent No. 6,787,783 ('783) to Marchman et al. Although the conflicting claims are not identical, they are not patentably distinct from each other.

In regards to Claim 1 of the instant application, Claim 1 of '783 includes the limitations of editing a feature of an integrated circuit by activating adsorbed gas molecules on the feature to be edited by locally supplying activating energy in the form of electrons.

In regards to Claim 5 of the instant application, Claim 6 of '783 includes the limitation of supplying an etch gas to the surface feature to be edited.

10. Claims 1, 5, 11, and 12 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 and 3 of U.S.

Patent No. 6,730,237 ('237) to Sievers et al. Although the conflicting claims are not identical, they are not patentably distinct from each other.

In regards to Claim 1 of the instant application, Claim 1 of '237 includes the limitations of supplying a chemical to a surface feature to be etched and directing a focused ion beam at the feature to perform the etching.

In regards to Claim 5 of the instant application, Claim 1 of '237 includes the limitation of supplying a gas to the surface feature to be etched.

In regards to Claim 11 of the instant application, Claim 3 of '237 includes the limitation of providing a mixture of gases to the surface feature to be etched.

In regards to Claim 12 of the instant application, Claim 1 of '237 includes the limitation of directing a focused ion beam at the surface feature to be etched.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

12. Claims 1-3, 5, 10-12 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,851,413 to Casella et al.

Casella et al. teaches a method of supplying locally both energy, in the form of an ion beam 20, and reactant material, in order to etch a recessed surface 26 of a substrate 28. (Column 6, Lines 1-34) The surface to be altered could be, for example, an exposed portion of a semiconductor device. (Column 3, Lines 47-53)

In regards to Claim 2, the reactant is supplied locally by the fluid delivery means 22. (Column 6, Lines 17-18; Column 8, Lines 48-50)

In regards to Claim 3, the fluid delivery means comprises a conduit 44, which communicates with a chamber 42. The reactant sprays from the lower aperture of the fluid chamber 42, said aperture being positioned to be proximate the surface to be etched. (Column 7, Lines 3-5, 46-51; Column 8, Lines 45-50; Figure 2)

In regards to Claim 5, the reactant is delivered in the form of a fluid, such as a gas. (Column 2, Lines 50-56; Column 6, Lines 17-20)

In regards to Claim 10, the activation energy for the etching process is provided in the form of an ion beam. (Column 6, Lines 31-34)

In regards to Claim 11, Casella et al. teaches that up to six chemicals can be supplied to assist in the etching process. (Column 10, Lines 4-5)

In regards to Claim 12, the activation energy is supplied in the form of a finely focused ion beam 20. (Column 6, Lines 9-13)

In regards to Claim 16, the reactant chemical(s) are provided in the form of a fluid directed at the surface to be etched. (Column 8, Lines 45-50)

13. Claims 1, 2, and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by "'Dip-Pen' Nanolithography on Semiconductor Surfaces" by Ivanisevic et al. (*J. Am. Chem. Soc.* **2001**, *123*, 7887-7889; from Applicant's IDS)

Ivanisevic et al. teaches a method for forming a pattern on a substrate, comprising providing a chemical locally to a site to be patterned. (p. 7887, second paragraph) Ivanisevic et al. also discloses that thermal energy can be provided to the substrate to increase the rate of deposition. (p. 7889, first full paragraph)

While Ivanisevic et al. does not expressly teach altering an existing pattern on the surface, as recited in the preamble of Claim 1 of the instant application, the disclosed method would be capable of altering an existing pattern, i.e. by adding lines to an already existing pattern.

In regards to Claims 2 and 4, the chemical is delivered locally to the site to be patterned by an AFM tip coated with said chemical. (p. 7888, "Discussion")

14. Claims 1, 5, 11, 12, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,055,696 to Haraichi et al.

Haraichi et al. teaches a method of etching only a specific part of a substrate, comprising directing an energy beam at the specific part of the substrate in a reactant gas atmosphere. (Column 8, Lines 65-69) This method can be used, for example, to repair a conductor in a large-scale integrated circuit (LSI). (Column 10, Lines 22-24)

In regards to Claim 5, the reactant chemical is a gas. (Column 8, Lines 65-69)

In regards to Claim 11, more than one chemical can be used in the etching process. (Column 2, Lines 63-69)

In regards to Claim 12, Haraichi et al. teaches that the energy should be supplied in the form of a focused energy beam (ion, electron, or laser). (Column 2, Lines 58-59)

In regards to Claim 15, the reactive chemical can be ambient. (Column 2, Lines 59-61; Column 8, Lines 66-67)

15. Claims 1, 5, and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication 2003/0003393 to Yamaguchi et al.

Yamaguchi et al. teaches a method of providing a chemical (photoresist layer 103) on a surface, and altering a desired site on the surface by selectively exposing the photoresist to near-field radiation. (Paragraph 0109) While Yamaguchi et al. does not expressly teach altering an already existing pattern, as recited in the preamble of Claim 1 of the instant application, the method taught by Yamaguchi et al. would be capable of altering an existing pattern; i.e. creating a patterned photoresist on a surface of an integrated circuit.

In regards to Claim 5, the photoresist is a fluid with a viscosity of between 1 and 10 cP. (Paragraph 094)

In regards to Claim 6, Yamaguchi teaches that the near-field radiation 105 can be generated by illuminating the tip of a probe 104. (Paragraph 0109; Figure 1B)

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. Claims 7, 8, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi et al. as applied to Claim 6 above, in view of "Strength of Electric Field in Apertureless Near-Field Optical Microscopy" by Martin et al. (IBM Research Report, RC21891 (98484) 11/9/2000; from Applicant's IDS), and in light of "Absorption of electromagnetic radiation" by West (AccessScience@McGraw-Hill, http://www.accessscience.com, DOI 10.1036/1097-8542.001600, last modified: March 6, 2001.)

Yamaguchi et al. teaches the limitations of Claim 6, on which Claim 7 depends. Yamaguchi et al. also teaches that the illumination of the probe tip produces near-field radiation. (Paragraph 0109)

Yamaguchi et al. does not teach that the probe comprises a non-metal portion and a metal apex portion; that localized photon scatter produces the near-field EM field amplification; or that the illumination wavelength is at least about ten times greater than the diameter of the probe tip apex.

Martin et al. teaches that optical near-field enhancement can be produced by illuminating a gold probe tip mounted on a non-metal probe. (Conclusion, second paragraph) The tip acts as a scatterer. (Conclusion, first line) Martin et al. also teaches that the tip can be hemispherical, with a diameter less than one-thirtieth of the wavelength of the illumination. (D=20 nm, λ=633 nm; "Modified Tips," third paragraph)

It would have been obvious to one of ordinary skill in the art to modify Yamaguchi et al. to generate the near-field enhancement by photon scatter from the probe taught

by Martin et al. The motivation for using a non-metal probe tipped with a metal apex to cause localized photon scatter, as taught by Martin et al. ("Conclusion," second paragraph), would have been that the different material composition at the tip helps to recover resonance effects, thereby further enhancing the electric field at the tip. The motivation for having the diameter of the tip be less than one-thirtieth of the wavelength of the illumination would have been to avoid the dephasing effects from larger-dimensioned tips. ("Electric field enhancement for real tip systems," second paragraph)

Neither Yamaguchi et al. nor Martin et al. teaches that the localized photon scatter imparts thermal energy to the substrate, as recited in Claim 14. Nevertheless, the impact and absorption of the scattered photons would inherently impart thermal energy to the substrate. (See West, first paragraph)

18. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi et al. as applied to Claim 5 above.

Yamaguchi et al. teaches the limitations of Claim 5, on which Claim 13 depends. Yamaguchi et al. also teaches that the chemical provided to the surface comprises an illumination sensitive material. (Paragraph 072)

Yamaguchi et al. does not expressly teach that said chemical should be protected from illumination while be delivered.

Nevertheless, it would have been obvious to one of ordinary skill in the art to protect the photosensitive material from illumination while delivering it to the surface, such as by delivering it through an opaque tube. The motivation for doing so would have been to prevent the photoresist from hardening before reaching the surface.

Allowable Subject Matter

19. Claim 9 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

20. The following is a statement of reasons for the indication of allowable subject matter: The prior art teaches a probe tip comprising two electrodes with a gap there between, and a method of exciting plasma between the electrodes using RF frequency power. (U.S. Patent 5,961,772 to Selwyn; Column 5, Lines 6-29) However, the prior art does not teach or fairly suggest that the plasma can be excited by illuminating the electrodes with coherent radiation of two wavelengths, as recited in Claim 9 of the instant application.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571) 272-1219. The examiner can normally be reached on 10:30-7:00, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571) 272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Maureen G. Arancibia

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